Title: Graphing and Interpreting Linear Equations in Two Variables

Brief Overview:

Using linear equations of the form Ax + By = C, the lesson demonstrates how to make a table of values and graph using pencil, paper and the graphing calculator. The lesson also explores connections to real-life situations.

Link to Standards:

- **Problem Solving** Students will graph linear equation from a table of values.
- **Reasoning** Students will acquire an understanding of the relationship between the x and y components.
- **Connections** Students will use their knowledge of graphing linear equations to model real-life situations.

Duration/Length:

This lesson will take four or five 50-minute class periods.

Grade/Level:

Grades 8–12; Pre-Algebra and Algebra I

Prerequisite Knowledge:

Students must be skilled in evaluating expressions, solving an equation, plotting points in the xy - plane, and have knowledge of the basic features of a calculator.

Objective:

- To graph linear equations in two variables from a table of values.
- To use a graphing calculator to graph linear equations from a calculator generated table.
- To determine the x and y components and their relationship to each other in terms of a real-life situation.

Materials/Resources/Printed Materials:

- Graphing Calculator
- Graph Paper
- Ruler

Development/Procedures:

- The teacher will discuss dependent and independent components of a linear equation, show how to make a table of values for a linear equation of the form Ax + By = C and read a graph. Students will then do Activity #1 followed by the teacher checking for understanding.

- The teacher will show and discuss identification of x-components and y-components in a real-life situation. The relationship between the x and y components should also be discussed. Student should work on Activity #2.

- Prior to Activity #3, the teacher should load or have a student aide load the program for Activity #3 into the calculators (TI-82, TI-83). Students should be paired with a partner. Only one activity sheet per pair is needed.

Evaluation:

Students will be given a two - part quiz:
Part I - Individual
Part II - Calculator groups of two's

Extension/Follow Up:

- Have students analyze line graphs from newspapers and /or magazines.

- Use graphing calculator programs to graph and explore linear equations in two variables.

Authors:

Betty J. Henderson	Hayse I. Henderson	Hui C. Seymour
Old Mill Senior High School	Meade Senior High School	Albert Einstein High School
Anne Arundel County, MD	Anne Arundel County, MD	Montgomery County, MD

Activity #1

Complete the table for the given equation and graph the corresponding solutions on a sheet of graph paper.

1. $2x + y = 5$

x	2x + y = 5	y
0	2( ) + y = 5	
1	2( ) + y = 5	
-1	2( ) + y = 5	
$-\frac{1}{2}$	2( ) + y = 5	

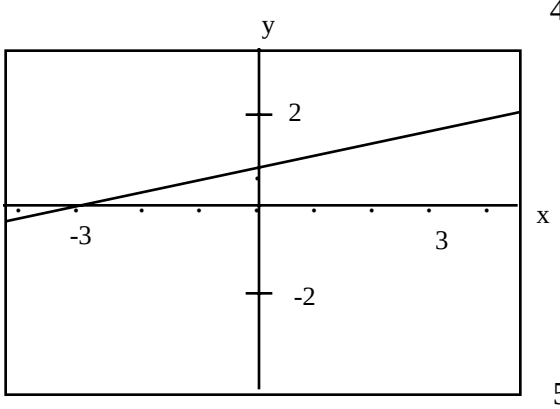
2. $\frac{1}{2}x - y = 2$

x	$\frac{1}{2}$ x - y = 2	y
0	$\frac{1}{2}$( ) - y = 2	
	$\frac{1}{2}$( ) - y = 2	0
-2	$\frac{1}{2}$( ) - y = 2	
	$\frac{1}{2}$( ) - y = 2	2

3. $x + y = 8$

x	y

Use the graph to answer questions #4 and #5.



4. Write a table of integer values for the equation of the graph.

x				
y				

5. On the graph, circle the value of y when $x = \frac{1}{2}$ and the value of x when y = -1.

Activity #2

1. The moon is smaller than the earth, so its gravitational pull is less than the earth's. An object on the moon weights only one-sixth of the earth's weigh.

   a. Which component represents x? (earth, moon)

   b. Which component represents y? (earth, moon)

   c. As the x-component increases, what happens to the y-component?

2. David earns $5 an hour at his after - school job.

   a. What component represents the amount of money David earns? (x , y)

   b. Which component represents the number of hours he worked? (x , y)

3. A river has risen 6 feet above flood stage. Beginning at a time of t = 0, the water level drops at the rate of two inches per hour.

   a. x-component is represented by _____.

   b. y-component is represented by _____.

   a. As the x-component increases, what happens to the y-component? _____

4. Alicia Martinez has had her first novel accepted for publication she signed contracts to receive a royalty rate of 5% of the retail price of each book.

   a. What component represents the number of copies sold? (x , y)

   b. What component represents the royalty received by Alicia? (x , y)

5. Your friend started driving from home at 55 miles per hour for 3 hours.

   a. Which component represents x? _____

   b. Which component represents y? _____

Activity #3

This program will generate a table of values for any linear equation.

```
PROGRAM:NEW
Prompt A,B,C
Lbl X
Prompt X
Prompt R
Prompt S
Prompt T
(C-A*X)/B->Y
(C-A*R)/B->W
(C-A*S)/B->Z
(C-A*T)/B->I
Disp "X1 X2 X3 X4"
Disp X,R,S,T
Pause
Disp "Y1 Y2 Y3 Y4"
Disp Y,W,Z,I
Pause
Menu("ANOTHER TABLE","YES",X,"STOP NOW",U)
```

To generate a table automatically:

a. Press Y=
b. Enter your equation
c. Press 2nd then window (TbLSet)
d. Enter the number you want the table to start with
e. Press the table
f. Press Auto for independent
    1. Press Auto for dependent
    2. Press 2nd then graph (Table)

Activity #3, continued

Use the program to generate a table for the linear equation:

1a. $3x + 4y = 12$

A = 3; B = 4; C = 12

x	-4	0	4	-8
y				

1b. $x - 4y = 6$

A = 1; B = -4; C = 6

x	-4	0	4	-8
y				

Use the TI-82 or TI-83 to generate a table of values automatically.

2a. $3x - y = 6$ 2b. $x - 6y = 0$ 2c. $x + 7y = 15$

Use the TI-82 or TI-83 to generate a table of values manually.

3a. $5x + y = 1$ 3b. $x - y = 0$ 3c. $x + 7y = 15$

Quiz **Name:_____**

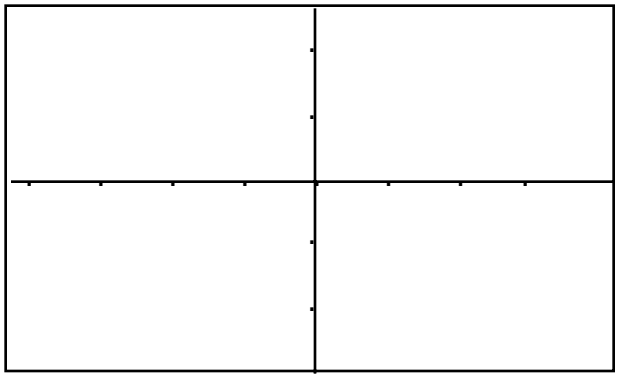
Part I

Use x + y = 4 to answer questions 1 and 2.

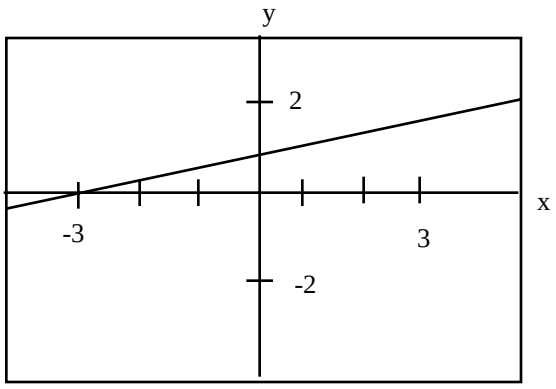
1. Make a table of values.

x				
y				

2. Graph using the table of values form exercise 1.



3.



x				
y				

a. Write a table of values for the graph.

b. What is the value for y when x $= \frac{1}{2}$?

c. What is the value for x when y $= 1\frac{1}{2}$?

4. From 1970 to 1990 the number of registered automobiles in the U. S. increased by a rate of about 4 million automobile per year.

   a. What component represents x? _____

   b. What component represents y? _____

   c. As the x-component increases what happens to the y-component? _____

Quiz **Name:_____**

Part II (Calculator)

5. Use 3x - 2y = 6 to answer the following.

a. Graph using the graphing calculator.

b. Use the graphing calculator to generate a table of values. Start with x = -3 and Tbl = 1.

x				
y				

c. Use the graphing calculator to find the value of y when x equals

i) 1.5 ii) 10 iii) -8.5

Part III (Program)

Use the program to generate a table for the linear equation:

1a. $3x + 4y = 12$

A = 3; B = 4; C = 12

x	-4	0	4	-8
y				

1b. $x - 4y = 6$

A = 1; B = -4; C = 6

x	-4	0	4	-8
y				

Use the TI-82 or TI-83 to generate a table of values automatically.

2a. $3x - y = 6$ 2b. $x - 6y = 0$ 2c. $x + 7y = 15$

Use the TI-82 or TI-83 to generate a table of values manually.

3a. $5x + y = 1$ 3b. $x - y = 0$ 3c. $x + 7y = 15$

Answer Key

Activity #1

1. (0,5) (1,3) (-1,7) $(\frac{1}{2}, 4)$

2. (0,-2) (4,0) (-2,-3) (8,2)

3. (1,7) (0,8) (-5,13) Answer vary

4. (-3,0) (0,1) (3,2) (6,3) etc.....

5. y = 7/6 ; x = -6

Activity #2

1a. earth 1b. moon 1c. It increases

2a. y 2b. x

3a. time 3b. water level

4a. x 4b. y

5a. hours drove 5b. distance

Active #3

1a.

x	-4	0	4	-8
y	6	3	0	9

1b.

x	-4	0	4	-8
y	-2.5	-1.5	-.5	-3.5

Answers vary for 2a, 2b, 2c, 3a, 3b, and 3c.